VENUS GRAVITY FIELD DETERMINATION: PROGRESS AND CONCERN;

W .1.. Sjogren; A.S. Konopliv, Jet Propulsion Laboratory/California Institute of Technology, Pasadena, CA 91109

New gravity data from the Magellan spacecraft are continuing to be acquired and reduced, revealing new results for the high latitude regions. There is a big concern that NASA may terminate Magellan before complete uniform gravity coverage is obtained, leaving sizable data gaps over very important features,

The Magellan spacecraft has been producing excellent gravity data since September 1992 when periapsis was lowered to 180 km and daily coverage was obtained for 360° of longitude, However the eccentricity of that orbit produced high altitudes over the polar regions such that the gravity signals were greatl y attenuated. As a result the resolution above 40° N latitude and 20°S latitude is very poor, To achieve complete uniform gravity coverage, the Magell an project successful] y executed a 70 day aerobraking p] an from May 1993 to August 1993, which produced a near circular orbit having a periapsis altitude of 180 km and an apoapsis altitude of 550 km, To date, again, excellent gravity data have been acquired. in the near circular orbit good data are obtained from both apoapsis and periapsis tracking, unlike the eccentric orbit where only good gravity data are obtained near periapsis. So we should be in fat city. Not so. Due to the laws of celestial mechanics and some unfortunate timing the data coverage is not obtained in a nice continuous block as was the case for the previous coverage in cycle 4. It turns out that when either periapsis or apoapsis become occulted from the earth, that the data obtained from the now visible portion of the orbit is greatly redundant with the previous tracking. This is shown in figure 1 where at the end of cycle 5, April 15, 1994 there will exist a longitude gap of 125° over very important geophysical features such as Artemis, Atalanta, Tethus Regio, Aino Planitia, and Lada Terra. If the mission continues until Oct. 5, 1994, (It is now NASA's thinking to terminate operations on April 16,1994) this gap will be reduced to 55°. To obtain complete coverage the mission should be continued until March 1, 1995. (See figure 2).

We are presently acquiring data having the lowest possible altitudes over Ishtar Terra. However the spacecraft is also approaching solar conjunction and we may lose a sizable portion of these data due to high noise levels from the sun. We will discuss and display the results from these data with our best 40th degree and order spherical harmonic solution. We expect to have improvements over previous models in the areas of Beta, Metis, Guinwere, Sedna and Ishtar.

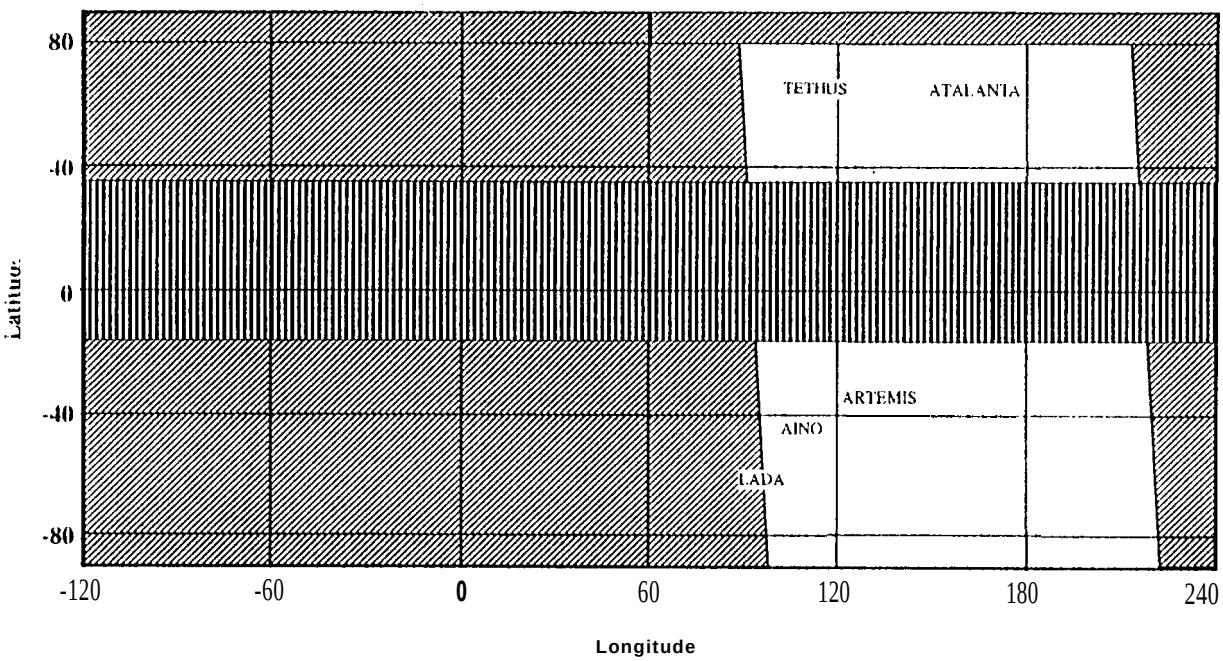

Figure 1 Magellan High Resolution Gravity Coverage
Vertical hash is good gravity data from cycle 4; the slant hash is anticipated coverage from cycle 5 by April 16, 1994.

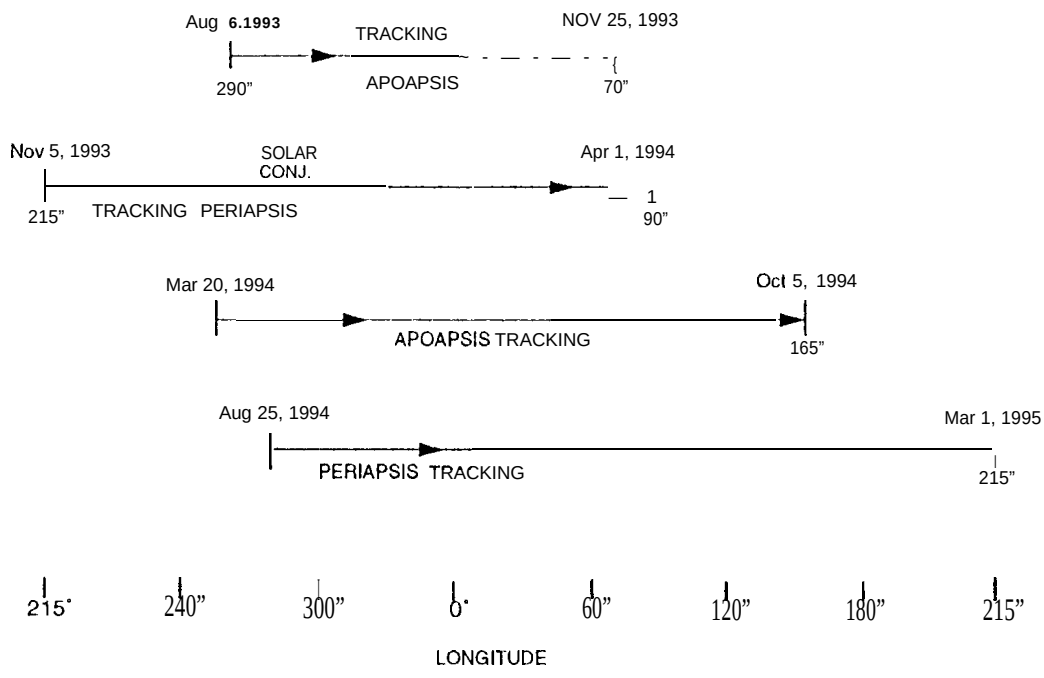

Figure 2 Maximum Gravity Data Coverage
Achievable in the near circular orbit
NOTE: considerable redundancy is obtained before 360° of longitude is covered.